

# Software Engineering Technical Practices

## COTS-Based Systems (CBS)



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**Sponsored by the  
U.S. Department of Defense**



# Agenda

- ➡ **Why a focus on COTS-Based Systems?**
- CBS 101- Reality and Challenges**
- SEI program of work**
- COTS Lessons learned**
- Possible opportunities**

# COTS Drivers

## Govt/DoD Strategy, Needs of key programs

- DII/COE
- spiral development
- Net centricity
- legacy systems



## Public Law, DoD Policy

- Clinger Cohen (1996)
- Acquisition reform
- Fed Acq Streamlining
- Revised FARS/DFARS,  
5000.1, 5000.2-R,  
8000.1



## Commercial trends

- Web, CORBA, Java,  
DOT
- Best practices, etc



# DoD Views

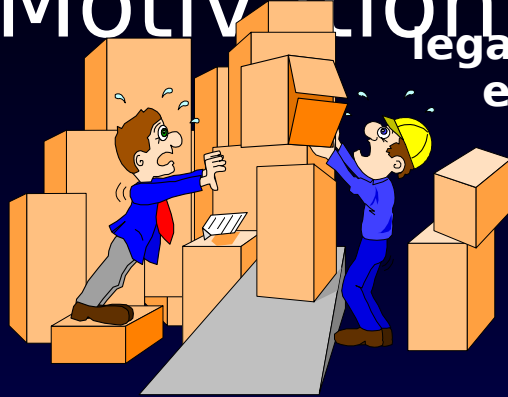
**“The Department must be leaner, more efficient, and more cost effective in order to serve the warfighter faster, better, and cheaper ... Improve the efficiency and performance of DoD support activities **by adopting innovative management and business practices of the private sector.**”**

William Cohen, Secretary of Defense, *Quadrennial Defense Review, Section VIII, May 1997*

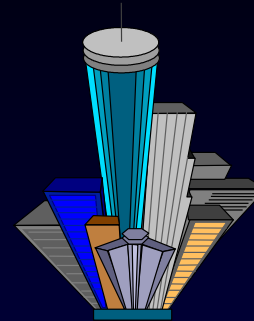
**“[Take] full advantage of the technologies and management lessons that have turned around American commerce and industry in the last decade.”**

Jacques Gansler, Under Secretary of Defense for Acquisition and Technology, Dec 1997

# COTS: Attraction and Motivation



legacy systems  
evolution

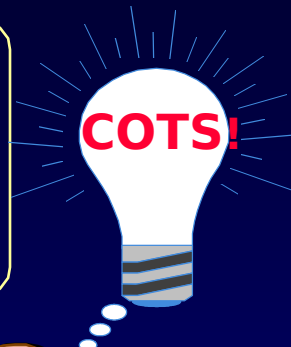


demands  
for new  
systems and  
functionality

Technology  
insertion

- Develop faster
- Reduce cycle time
- Leverage commercial investment & economies of scale
- Leverage new technology (Web)

Lower (life cycle) costs



MORE

acquisition  
reform

BUDGET

better

faster



# Inevitability of COTS-Based Systems

## Market Imperatives

- Maturing software industry
  - increasing commercialization
  - increasing market dynamism



## Market Consequences

- Accelerating introduction of new software products
- Continuing heterogeneity
- Increasing aggregate complexity

## Consumer Realities

- Innovation sells
- IT is increasingly vital
- Shrinking budgets
- Increasing pressure for reducing “time to market”



## Consumer Consequences

- Increasing reliance on off-the-shelf software products
- Use of increasing numbers of COTS products in systems

# Agenda

**Why a focus on COTS-Based Systems?**



**CBS 101- Reality and Challenges**

**SEI program of work**

**COTS Lessons learned**

**Possible opportunities**

# What is COTS?

**A COTS product has these essential elements:**

- It is sold, leased, or licensed to the **general public**.
- The supplier is a **commercial entity** in the business of **making a profit** from the product.
- The supplier provides **product support and evolution** and retains the **intellectual property rights**.
- Multiple, identical copies are available.
- Integrators use the product **without modification** of its internals.



# Status/Implications

- **COTS is not just a technical issue; it has total life cycle impact and critical business and management implications.**
- **COTS is not easy, nor a silver bullet, nor business as usual**
- **Community driven by mandates, Clinger-Cohen etc., without the needed infrastructure (reminiscent of Ada ?)**
- **Lots of “behind the power curve” technology and products accelerating**



# How Are Projects Doing With COTS?



- **system delivery refused - COTS documentation not Mil-Std 2167 compliant**
- **plane stuck on the tarmac - expiration of single software licenses**

• **Struggling with new technology, processes, issues**  
• **Large learning curve**  
• **Lots of mis-steps**



- **project reduced time to procure and develop by 2/3; reduced cost by factor of 4 (<\$300K Vs. >\$1,000K)**
- **6 year evolution project reduced weight by 12,500%, footprint by 3,714%, and power by 9,340%; speed (MIPS) increased by 238%**

# The Story of Two Real Projects

	<b><i>DCIS</i></b>	<b><i>MRP II</i></b>
<b><i>End-user Processes</i></b>	<b><i>Adapted product to existing processes</i></b>	<b><i>Adapted processes to product</i></b>
<b><i>COTS Selection</i></b>	<b><i>No pre-selection demos</i></b>	<b><i>“Try before you buy”</i></b>
<b><i>Stakeholders</i></b>	<b><i>Late involvement</i></b>	<b><i>Early involvement</i></b>
<b><i>Source</i></b>	<b><i>“Opportunity”-ware</i></b>	<b><i>COTS products</i></b>
<b><i>Modification</i></b>	<b><i>Allowed</i></b>	<b><i>NOT allowed</i></b>
<b><i>Vendor Relationships</i></b>	<b><i>Viewed as subcontractor</i></b>	<b><i>Viewed as partnership</i></b>
<b><i>Result</i></b>	<b><i>Project terminated</i></b>	<b><i>Deployed to sites</i></b>

# A Spectrum of COTS-Based Systems



*COTS-Solution  
Systems*

*One substantial product  
(suite) tailored to provide  
significant system  
functionality*

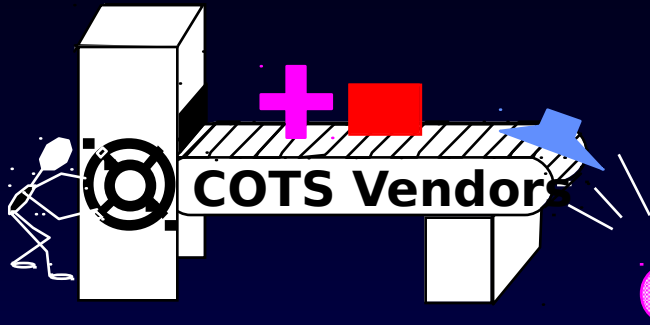
- generic solutions; tightly coupled to end user ops concept/business processes
- vendor maintains products
- tailoring, parameterization focus

*COTS-  
Aggregate  
Systems*

*Multiple products from  
multiple suppliers integrated  
to collectively provide  
system functionality*

- probably more flexible in supporting end user ops concept/business processes
  - project maintains overall system
  - integration, engineering focus products/parts are “black boxes”
- COTS, NDI, legacy

# COTS - Challenges and Reality



???

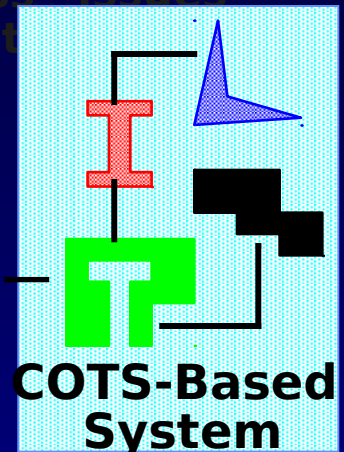
- Frequent change in COTS products and marketplace
- Limited control of frequency or content of COTS releases
- Products driven by market, not your system context
- Vendor differentiation

- Limited visibility into product quality and behavior
- Varying architectural paradigms
- Dependencies between products
- Built-in models of use

- New "business" issues (licensing, data warranties)

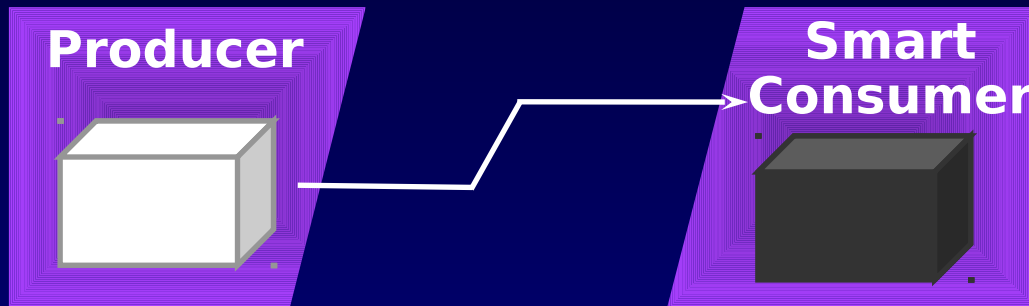


???



# The moral of the story is...

- The COTS marketplace drives continuous system evolution.
- Integration is not a one-time event. Systems must be engineered to accommodate marketplace realities.
- Need to develop and mature practices and skill sets for successful COTS-based acquisitions and technology refreshment.
- We need to become **smart consumers**.



**Before**

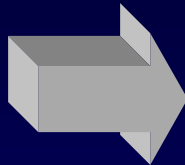
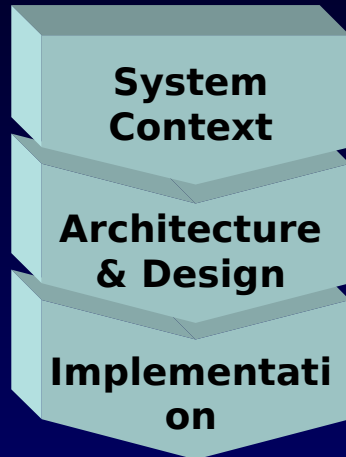
- emphasized implementation
- specified **what** and **how**

**After**

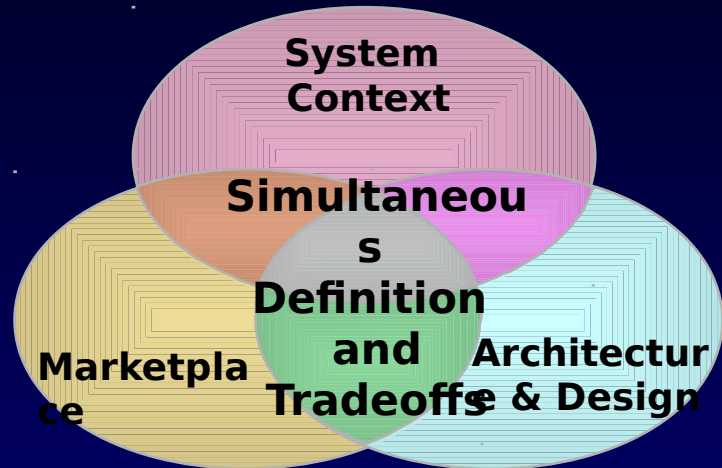
- emphasize interface
- specify **what**, not **how**

# Fundamental Culture Shift

## Traditional Approach (Waterfall Development)

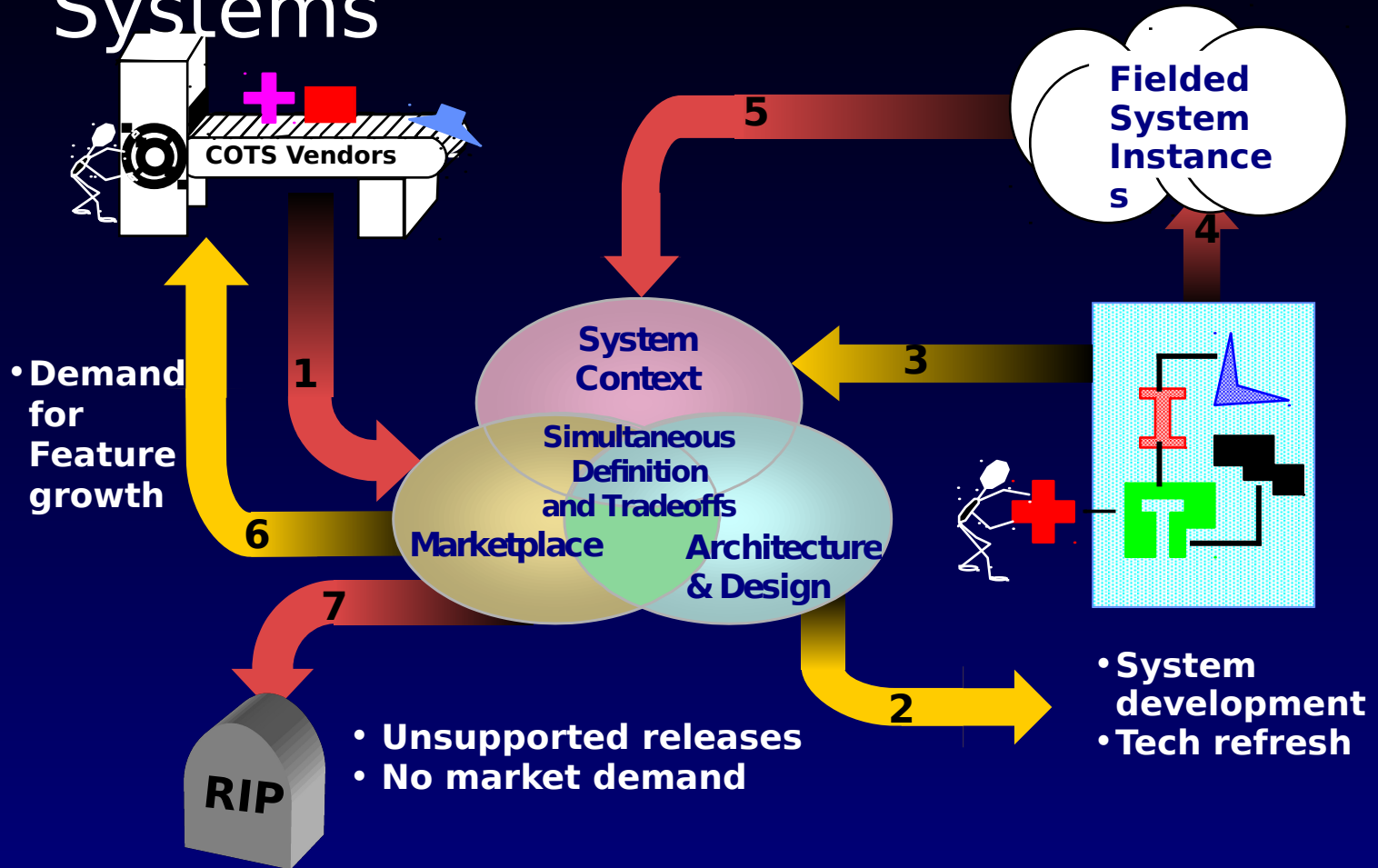


## Required COTS Approach (Spiral Development)




*Build from Scratch      Buy, Integrate, Continuously Refresh*

# Cyclic Nature of COTS-Based Systems





# Changing Paradigms ...

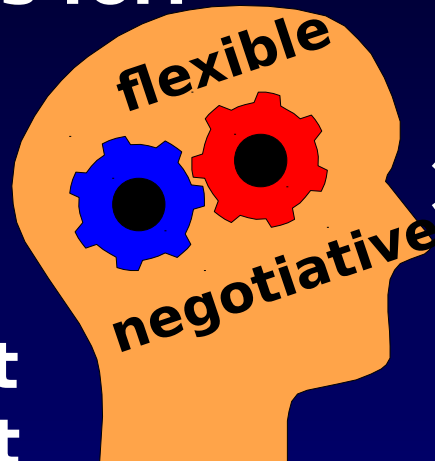
<b>Traditional</b> 	<b>With COTS</b>
<b>Linearity of requirements, marketplace, design, code architecture/design, system</b>	<b>Simultaneity of</b>
<b>Engineering for development evolution</b> - principal asset = code - waterfall - development builds integration	<b>Engineering for</b> - principal asset = design - spiral or iterative - early, continuous
- maintenance distinct into products	- maintenance subsumed into ongoing evaluation of technologies
from development <b>Direct control of components marketplace</b>	<b>Influencing the</b>
<b>data</b>	<b>Business issues: Licenses, rights, warranties</b>

# Implications of Fundamental Change

**Mindset must change *AT ALL LEVELS*  
*and in all disciplines and roles.***

**New processes for:**

- end-user operations
- end-user involvement
- development
- management



**Contracts**

**Budgets**

**Funding**

**Strategies  
& Plans**

# Agenda

**Why a focus on COTS-Based Systems?**

**CBS 101- Reality and Challenges**

 **SEI program of work**

**COTS Lessons learned**

**Possible opportunities**

# CBS Initiative Focus Areas

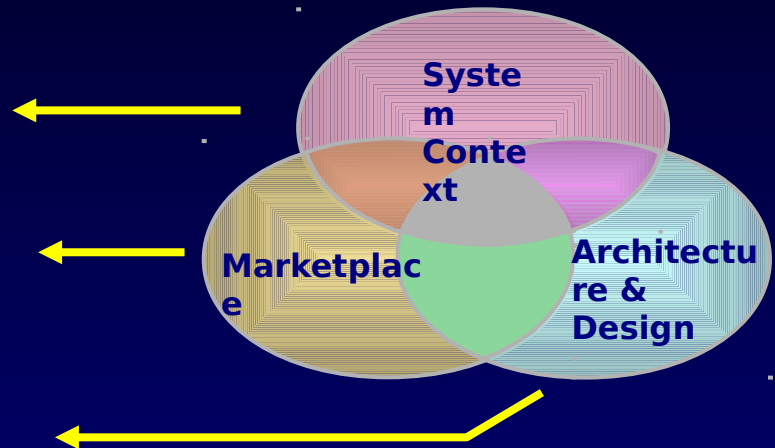
- **Acquisition and Management:** Establish practices that align with the realities of the COTS marketplace
- **Design and Engineering practices:** Establish guidelines with particular emphasis on:
  - integration techniques
  - distributed object and component technology
  - Web-based systems
- **Product and Technology evaluation:** Evolve and transition practices and techniques.
- **Educate decision makers and influence**

# Maturing COTS Evaluation Techniques

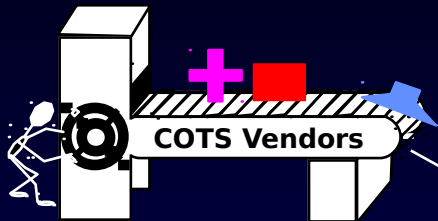
**Goal: Develop tutorials and handbooks that document techniques to support the well reasoned selection of COTS products and technologies as components of larger systems.**

**Objectives and Impact:**

- **Identify methods to determine requirements feasibility and priority**
- **Refine methods to distinguish and prioritize commercial products and technologies**
- **Document approaches identifying the impact of COTS products on architecture and design**



# COTS Evaluation: Motivations/Applicability

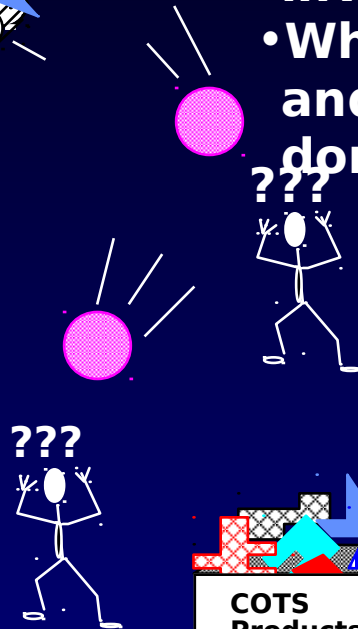


## Chief Technology Officer:

- Which *technologies* warrant investigation?
- What are the new concepts, and how do they apply to my domain?

## Architects/Acquirers:

- Which *products* are viable?
- Which *vendor* is viable?
- Which is “best fit?”



## Architect & Engineer:

- Which design best fits the product?
- What is the best way to integrate the product?

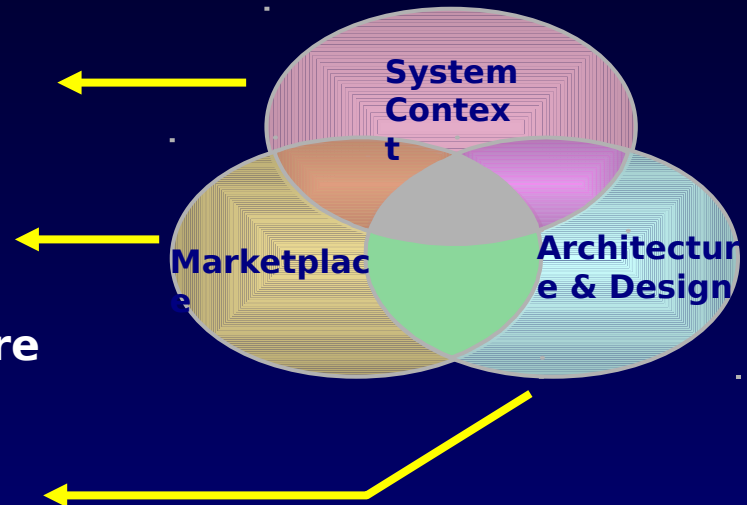


# Improving COTS Design & Engineering Practices

**Goal: Identify, document, and validate principles for design and engineering of COTS-based systems**

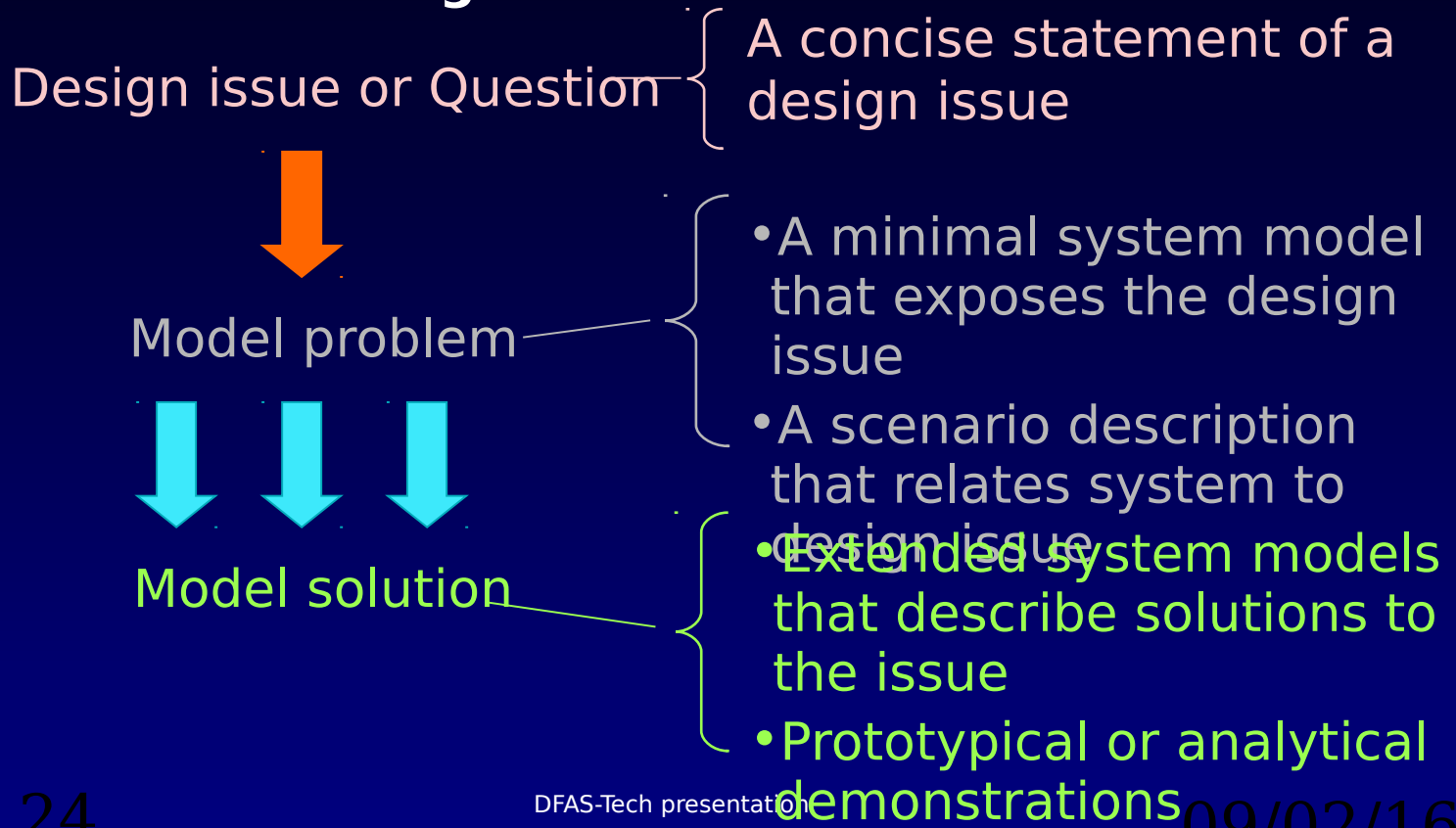
## Objectives and Impact:

- Identify variations in system context leading to different design decisions
- Determine implications of COTS products on requirements and architecture
- Define flexible architectures using COTS; Comprehend applicability of commercial directions (e.g. component technology, integration frameworks) to DoD/Govt systems



# Model Problems

**A reduction of a design issue to its *simplest* form, from which one or more *model solutions* can be investigated.**





# Model Problems/Experiments

-1

## Exists/Performed

- **Distributed Object Technology with legacy Fortran system (CORBA, COM, DCOM, Active-X, Java, Web)**
- **JEDMICS alternative designs (CORBA, Java, Web)**
- **Model problems for CORBA in real-time manufacturing**
- **DII COE - COTS product segmentation**
- **Secure intranets (JEDMICS) - Digital Certificates, Virtual Private Networks, SSL + IIOP, Browser databases**
- **Componentware for manufacturing - JAVA beans and component marketplace**
- **“Off-the-shelf” architectures - Enterprise Java Beans (EJB) portability model problem**

## In Development

- **Agent Technology - manufacturing Domain/Contract-net**

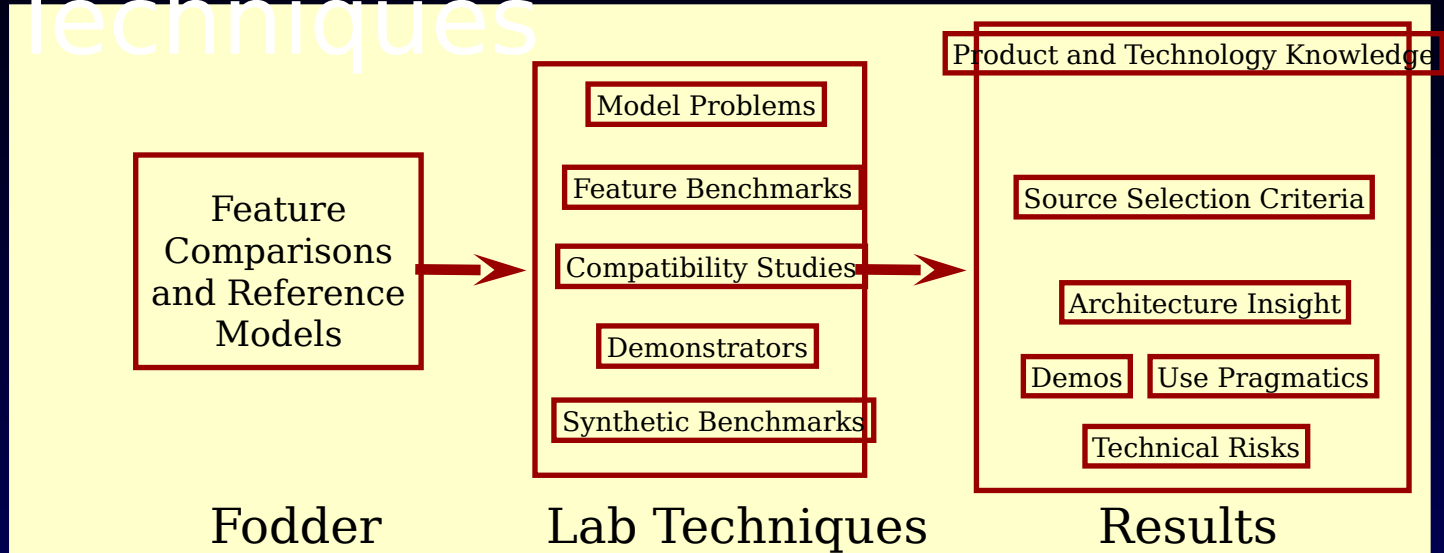
# Testbeds - Why?

- Risk reduction
- Obtaining core competency
- Technology evaluation
- Technology forecasting
- Planning system evolution
- Requirements determination
- Design and cost tradeoffs/alternatives

*"The supreme misfortune  
is when theory outstrips  
performance"*

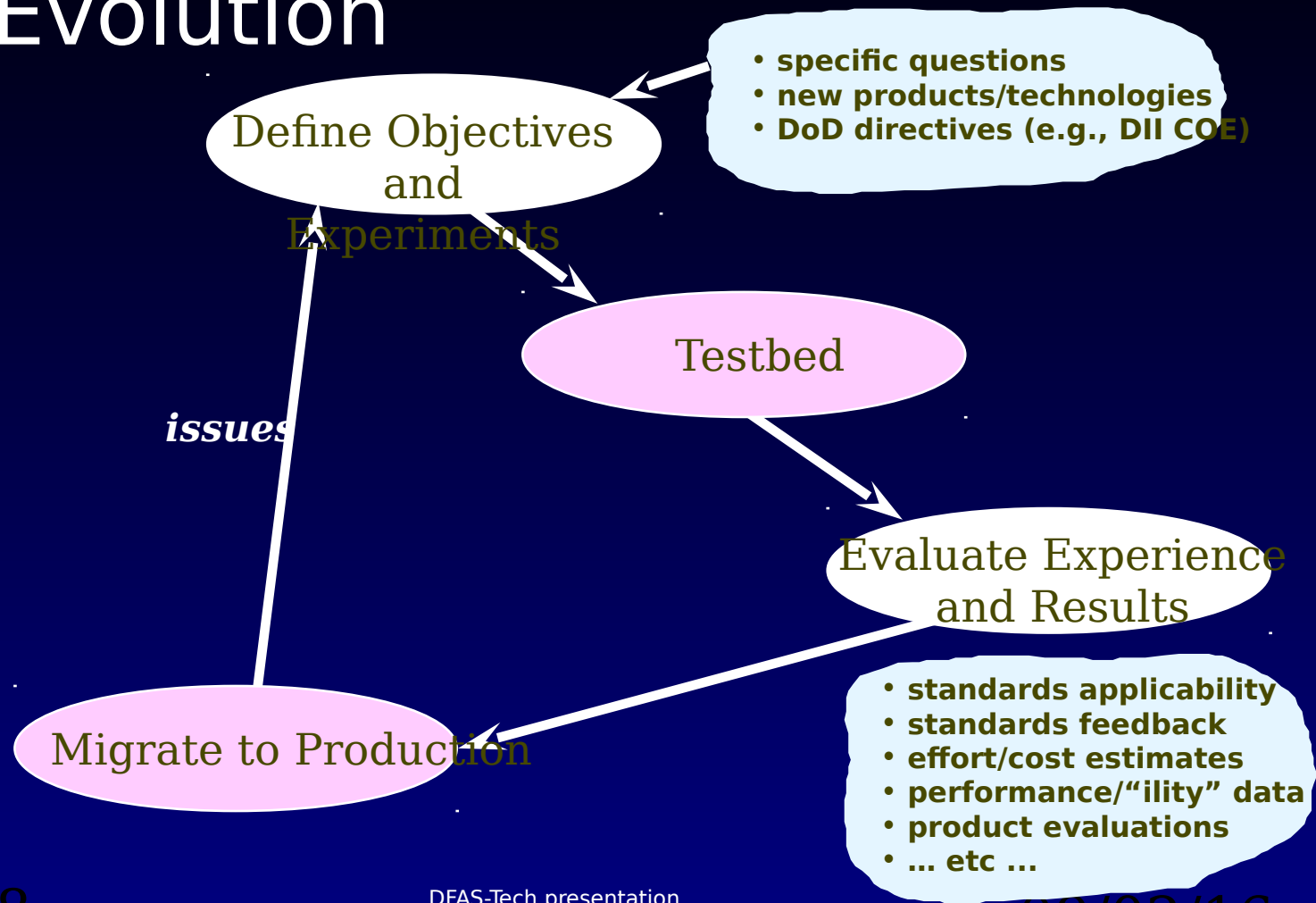
**-- Leonardo Da Vinci**

# Concept: Testbed Techniques



- Various CBS techniques have been defined and used benchmarks and feature studies isolate the product in question  
model problems and demonstrators combine products
- These same techniques are being applied to problem-specific evaluations:  
characterize architectural implications  
uncover product/architecture dependencies  
identify possible "vendor lock"

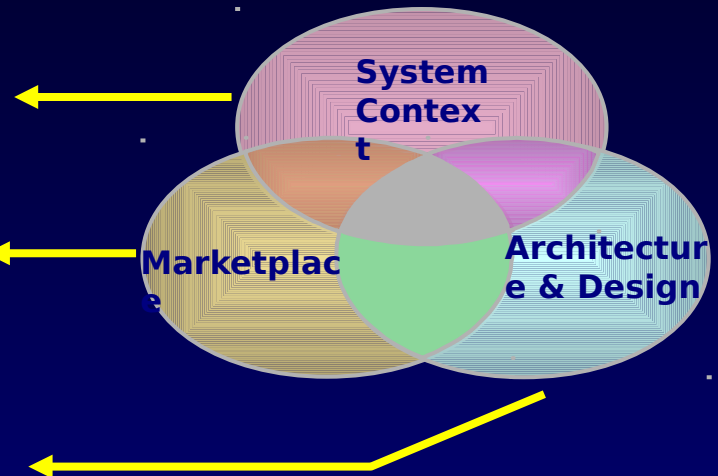
# Testbeds in Support of Evolution



# Developing COTS Acquisition and Management Practices

**Goal: Define acquisition and management practices needed to create and sustain COTS-based systems. This includes evolving familiar activities as well as describing new activities.**  
Objectives and Impact:

- Bring coherence to DoD acquisition climate through uniform ways to follow government policy directives
- Bring DoD engineering community into alignment with realities and imperatives of COTS marketplace
- Document practice framework (generic process elements) for designing and building COTS-based systems.



# New Roles and Skills

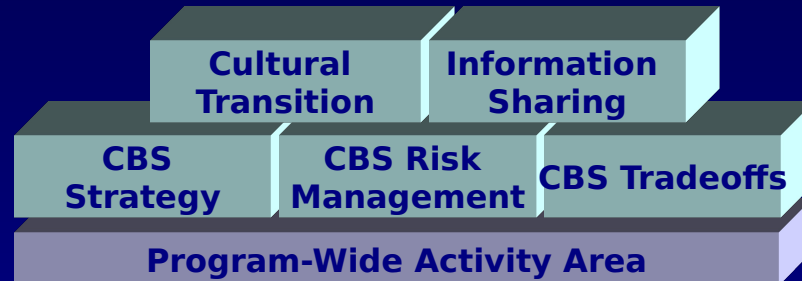
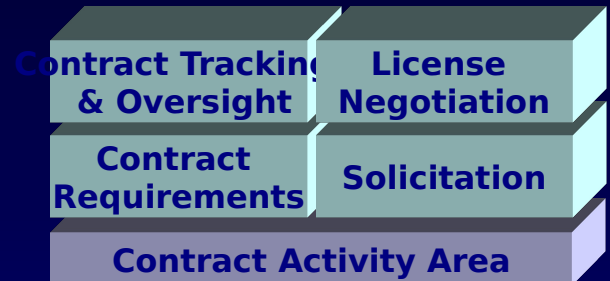
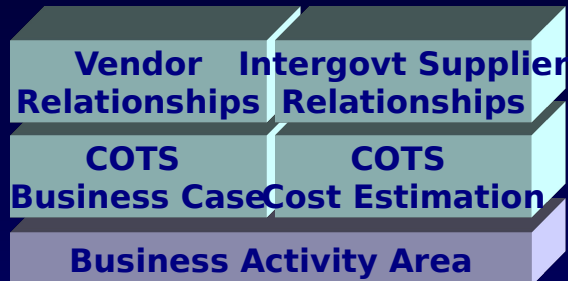
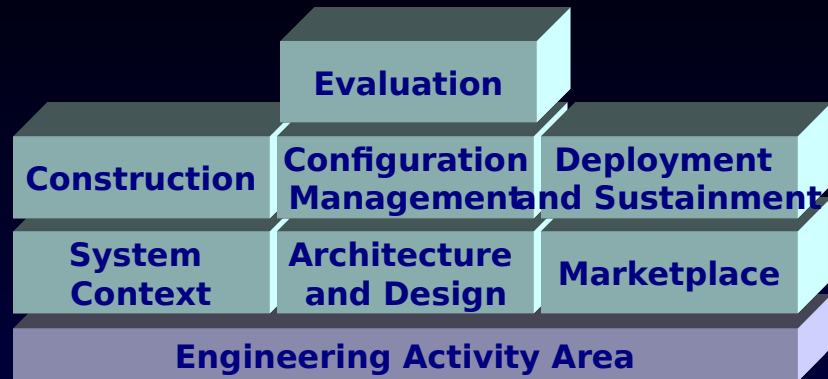
## **New/revised roles:**

- **product liaison**
- **architect**
  - **add business and negotiation skills**
- **product consultants**
- **integrator/troubleshooter**
- **technical liaison to procurement staff**
- **gap categorizer and prioritizer**

## **New skills:**

- **black-box testing and integration**
- **tracking marketplace**
- **deep product/technology knowledge**
- **evaluation**
- **COTS system engineering**
- **debugging sans source**
- **budgeting for COTS realities**

# Major CBS Activity Areas



# “Drill Downs”

**Purpose: in-depth information on specific COTS topics**

- **Earned value**
- **Analysis of alternatives/Business case process and examples**
- **Life cycle costing; including licensing, long term sustainment**
- **RFP/SOO/contracting language**
- **Selection Criteria**
  - **for product/product suite, relationship to design**
  - **for COTS integration contractor**
- **Requirements determination/tradeoffs:**
  - **Gap analysis, JAD/RAD, IPTs**
- **Spiral/iterative development**

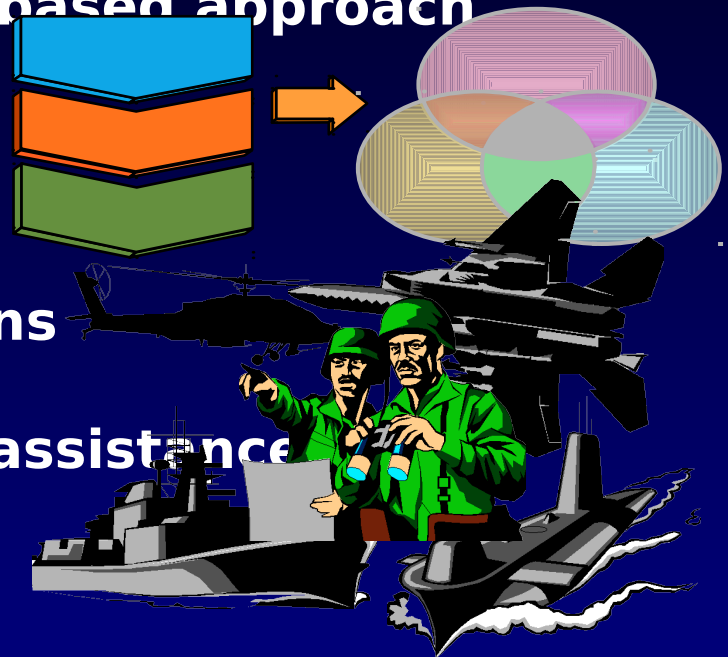


# Educate Decision Makers and Influence Policy

- **Purpose: technology transition to executives, program managers, technical managers of the pragmatics and challenges inherent in using a COTS based approach**

- **Means:**

- briefings/courses
- monographs
- conference presentations
- journal articles
- program guidance and assistance
- handbooks/guidebooks



# COTS-Based Systems “curriculum”

## COTS-Based Systems for Executives

- Audience: Executives (PEOs, DACs, CIOs...)
- Length: 2.5 hrs

## COTS-Based Systems for Pgm Managers

- Audience: Program/single managers, reporting to Execs. Possible: Functional managers, financial/budget
- Length: 4.5 to 5 hrs
- 2 derivatives for focused discussion/problem solving:

## COTS Evaluation (in revision)

- CBS for PMs with extended discussion (8 hours)
- ~~Audience: Program Managers (8 hours)~~
- Length: 8 hrs

## COTS-Based Systems in Practice To be developed

- Audience: Program staff; engineers, proposal evaluators, contract personnel
- Length: 1-2 days

**Also available:**  
**Open Systems**  
**for Executives**  
**4.5 hours**

# COTS Monographs

## Background:

- **Purpose**: Provide clarification and focused guidance for program managers trying to implement DoD COTS policies (leverages success of “Commandments of COTS” paper)
- **Sponsor**: OASD(C3I)/IT
- **Philosophy**: Provide best information possible *now*, update as needed later
- **Approach**: focused, pragmatic, easy read. ~ 10-12 pages each

## Benefits:

- DoD/US Government gets needed guidance on implementation of COTS-related policies in digestible form
- SEI develops material that contributes to handbooks and general guidance
- Knowledge acquired while working with specific customers under TOSPs will often provide foundation for other projects

# COTS Monographs

## TOPICS

## STATUS

- |  |                               |
|--|-------------------------------|
| • Assembling large systems from COTS   | Complete/on web components... |
| • Open Systems and COTS  | Complete/on web               |
| • Case Study: Correcting system failure in a COTS-based information retrieval system | Complete/on web               |
| • Isolating faults in a complex COTS based system                                    | Complete/on web               |
| • Case Study - NDI based system  | Complete/on web               |
| • Case Study - Evaluating COTS products for  | DoD information systems       |
| Complete/on web  |                               |
| • Clarification of DoD policies on COTS  | Complete/on web               |
| • Security/COTS  | Complete/on web               |
| • Decision factors for choosing COTS products  | 1st Draft in prep             |
| • The Role of Evaluation in Developing COTS-based Systems                            | 1st Draft in prep             |

<http://www.sei.cmu.edu/cbs/monographs.html>

# Misc SEI Technical Notes

- **Custom vs “Off-The-Shelf” Architecture: A Component-Based Trend for Modern Enterprise Systems**
- **Theory and practice of Enterprise JavaBean Portability**
- **Into the Black Box: A Case Study in Obtaining Visibility into Commercial Software**
- **COTS in the Real World: A Case study in Risk Discovery and Repair**

# CURE - What is it? - 1

## **A COTS Usage Risk Evaluation (CURE) is:**

- **A risk evaluation and mitigation approach specifically aimed at COTS-related issues**
- **A front-end analysis tool to uncover common risk areas for Program Managers and Contractors of COTS-based acquisitions**

## **A CURE consists of:**

- **A detailed questionnaire covering fourteen aspects of a program**
  - **Questionnaire is answered by both Contractor and Program Manager**
  - **Questionnaire seeks data on previous programs as well as the current program**
- **An Evaluation Report that analyzes the COTS-related risks to the program and suggests mitigations to those risks**

# CURE - What is it? - 2

**Questionnaire covers the following topic areas:**

- High-level profile of the project**
- Contractor background**
- Management readiness**
- Contractual issues**
- Non-developmental software**
- System profile**
- Standards**
- Evaluation of commercial products & technologies**
- Vendor relationships**
- Development approach & environment**
- Requirements**
- System design**
- Testing**
- Maintenance & upgrade**

# Who should have a CURE?

**This evaluation approach will be useful for:**

- **Any Program Manager who is acquiring a COTS-based software system**
- **Any organization wishing to become more aware of common COTS-related risk areas**



# What is involved?

## **Preparation by both Program Manager and Contractor**

- **Data from previous programs**
- **Data about the current program**

## **Application of an extended Questionnaire**

- **Given to each organization during a 2- or 3-day visit (total)**
- **Data elicited through interviews with key personnel**

## **Evaluation Report**

- **Delivered within 10 days**
- **Prioritization of risks and suggested mitigations**
- **Optional followup visit**

# Why is CURE Useful?

**Three key characteristics make CURE useful for a COTS-based acquisition**

- **Broad-based: identifies risk areas from both the Program Manager and Contractor perspectives**
- **Pragmatic: wherever possible, suggests mitigations to risks**
- **Objective: pulls no punches in telling both parties about any unreadiness to execute a COTS-based program**

# What is the Best Time for CURE? - 1

**Ideal occasion for CURE is before source selection**

- **Provides valuable COTS-specific discriminators**
- **Can then become an ongoing management tool when a Contractor is selected**

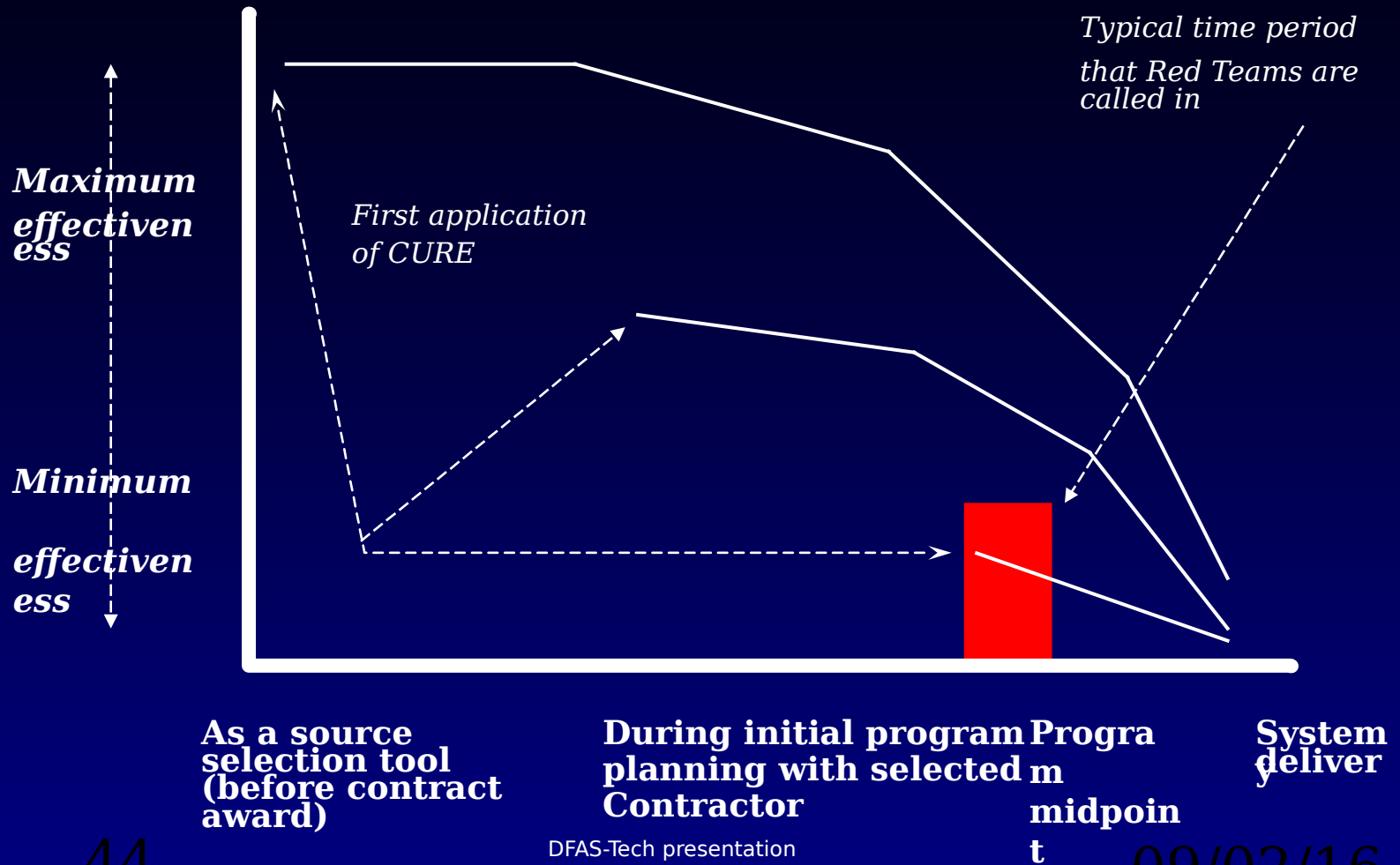
**Also valuable soon after contract award**

- **Can help a Program Manager and Contractor jointly refine the details of a program**

**Least useful occasion is after a program has been in existence for a long period**

- **May indicate how existing risk can be mitigated**
- **Could also be a useful mechanism for a Red Team**

# What is the Best Time for CURE? - 2



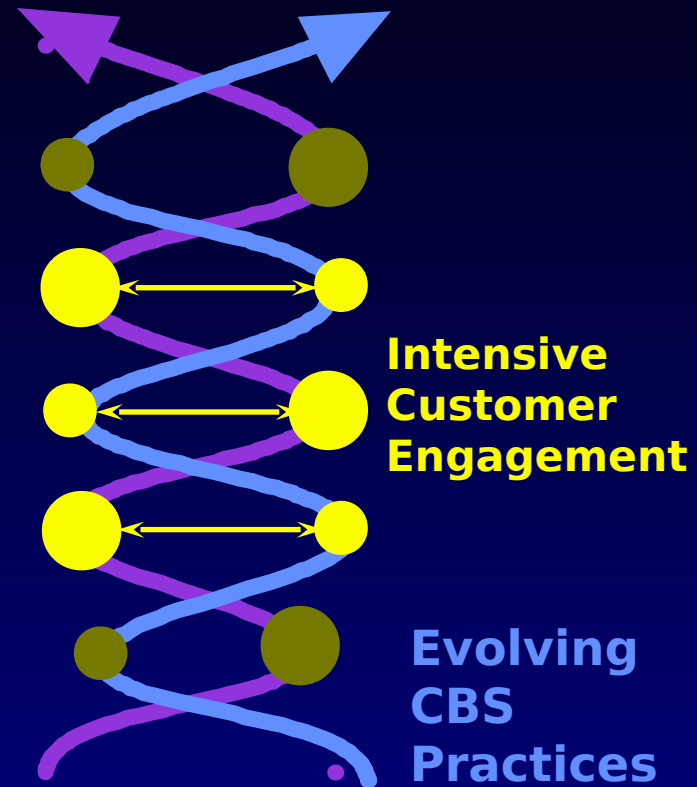
# Improving Practice Through Customer Engagements

***“The supreme misfortune is when theory outstrips performance”***

**-- Leonardo DaVinci**

**Knowledge acquired while working with customers contributes to handbooks, case studies, guidance**

**material      Customer  
Needs/Requirements**



# Customer Collaborations -1

## **Joint Engineering Data Management Information and Control System (JEDMICS)**

- system evolution from C++ and proprietary technologies to Web-based approach using CORBA, Java, PKI, Netscape, other COTS
- product/technology evaluation and design analysis/guidance using model problems

## **Electronic Systems Center/Acquisition Development Office**

- Developed handbook for program managers containing guidelines for using COTS in ESC systems

## **Office of Assistant Secretary of Defense/C3I (OASD/C3I)**

- Developed focused guidance for program managers trying to implement COTS policies
- <http://www.sei.cmu.edu/cbs/monographs.html>

# Customer Collaborations -2

## **Environmental Protection Agency, Office of Water Quality**

- Designed, implemented proof-of-concept demonstrations of integration framework for next-generation simulations
- emphasis on component-based systems, evolvability, and heterogeneity

## **Federal Aviation Administration**

- work directly with FAA tech center to develop guidelines for test and evaluation of COTS/NDI based products
- improve acquisition of COTS-based systems within the FAA's policy. (Institutionalization of "try-before-you-buy" policy)

## **National Institute of Standards and Technology Manufacturing Engineering Laboratory (NIST/MEL)**

- distributed object technology (DOT) in manufacturing

# Agenda

**Why a focus on COTS-Based Systems?**

**CBS 101- Reality and Challenges**

**SEI program of work**

 **COTS Lessons learned**

**Possible opportunities**



# 5 Great Lies...

- **COTS is only a technical change.**
- **We'll just modify the COTS.**
- **I don't have to test anymore.**
- **Industry/My contractor will do it all.**
- **COTS may (will?) save me money.**

# Management

## General

- experienced
- effective IPTs
- contractor relations

### Examples:

- Program with no measures, spotty reviews
- + Program with strong user-government-contractor IPTs

## COTS Additions

- COTS skill sets
- partnering
- new engineering models

### Examples:

- Program that persists in a waterfall approach
- + Program that uses RAD/GAP analyses, brings users in early

***With COTS, behaviors that may have been optional before are now essential to your survival and success!***

# Attention to Business Processes

- **Comprehending product “models of use”**
  - **Negotiating between requirements and marketplace**
  - **Involving end users**

## **Examples:**

**- Program whose end users expect the new system to behave like the legacy one**

**- Program unable**

**to adopt new**

**+ Program investment in new processes for negotiating requirements, with user help**

# COTS Smarts

- **Knowing what's COTS and what's not**
  - **Discouraging COTS modification**
  - **Fostering realistic expectations**

## **Examples:**

- |   |  |
|---|--|
| <b>- Program bought a product from commercial concern in similar business</b> | <b>+ Program made careful, bonafide COTS selections with hard “no modification” rule</b> |
| <b>- Program that wants “ 1990’s capabilities with</b>                        | <b>+ Program adopting spiral development</b>   |

# Marketplace Knowledge

- Trying before you buy
- Knowing your vendors
- Guarding against “technology-of-the-week”

## Examples:

- |   |  |
|---|--|
| - Program with lack of product familiarity                            | + Program designing with model problems    |
| - Programs making selection based on only functional or only business | + Program creativity in license agreements |
|   | + Program weighing cost, approaches        |

# Aggregate Lessons Learned

- **Process:** COTS will affect/change system/software engineering processes
- **People Skills:** System skills required for COTS are at least as significant as for custom software development
- **Product Knowledge:** Detailed product knowledge is essential, testbeds are needed, product evaluation is not a one time event - necessary for system evolution
- **Roles:** New modes of business means hard work, involvement, learning new things by all players (not just contractors)
- COTS means giving up (some) control
- NO guarantee of “better, faster, cheaper”

# COTS is Radically Different

## Mil Spec

**Requirements driven**  
**Spec focus**  
**Rigid requirements**  
**Unique architecture**  
**Owner controls evolution**  
**Stable design**  
**Ignore evolution**  
**(refresh)**  
**Cost emphasis**  
**Make custom hardware**  
**Develop software**  
**Obsolescence**  
**Waterfall-style development**

## COTS

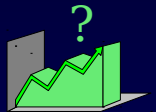
**Market driven**  
**Business plan focus**  
**Flexible requirements**  
**Open system architecture**  
**Market controls evolution**  
**Constant changes**  
**Design for evolution (tech**  
**TOC emphasis**  
**Buy from catalog**  
**License software**  
**Earlier obsolescence**  
**Spiral development**

# Keys to CBS Success



## **Make COTS-Based System Tradeoffs**

- **Reconcile Products and User Operations**
- **Leverage the Marketplace**
- **Engineer an Evolvable Architecture**
- **Make Tradeoffs Simultaneously**
- **Avoid COTS Modification**



## **Think More Like a Business**

- **Live by the COTS Business Case**
- **Negotiate Licenses & Supplier Relationships**
- **Realign Budgets for COTS Realities**



## **Establish Evolution as a Way of Life**

- **Evolve COTS-Based Systems Continuously**
- **Take the Long View on System Acquisition**



## **Change the Culture**



# Agenda

**Why a focus on COTS-Based Systems?**

**CBS 101- Reality and Challenges**

**SEI program of work**

**COTS Lessons learned**

 **Possible opportunities**

# Providing Assistance to Programs Using COTS

## Investment & Business Analysis

- Strategic planning for COTS
- End user/Business process examination
- Technology selection

## Design Risk Reduction

- Open Systems
- Standards
- Design for evolution
- Incremental/spiral approaches
- Model problems
- Tradeoff of market/design/requirements

## Acquisition Risk Reduction

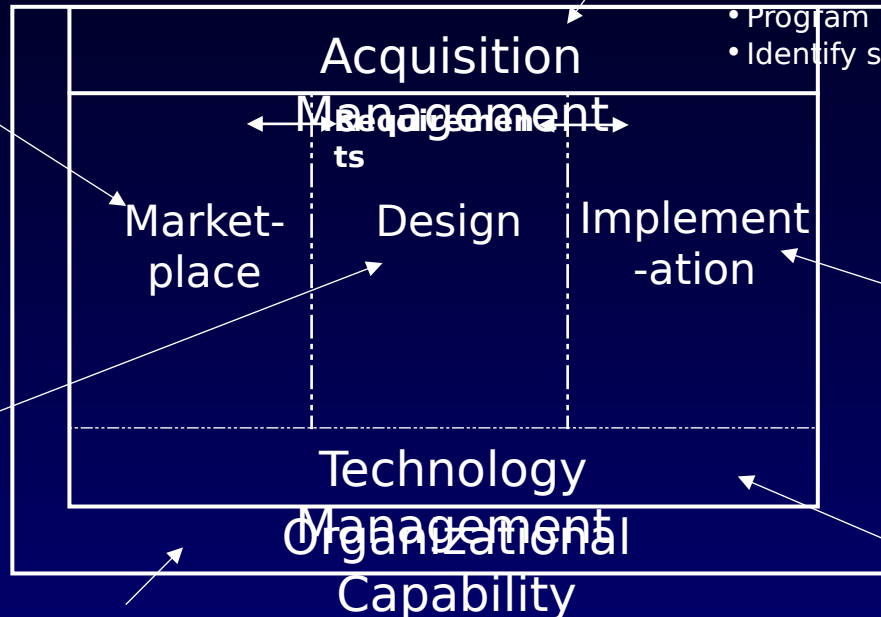
- Define alternate approaches
- Government & DoD policy
- RFP language/evaluation
- Program reviews
- Identify sustainment costs

## Technical Risk Reduction

- Prototypes
- NDI, Legacy systems
- Integration
- Interoperation
- Distributed objects
- Web-based systems
- Security (PKI, etc.)

## Sustaining Competence

- Testbeds
- Product & Technology evaluation practices
- Technology watch



## Courses/workshops

- COTS Based Systems for Execs
- COTS Based Systems for PMs
- Open Systems for Execs
- COTS Evaluation

DFAS-Tech presentation

# Possible Opportunities -1

- **Use COTS Usage Risk evaluation (CURE) method on real programs**
- **Present COTS Based Systems for Executive (CBS for Execs) and COTS Based Systems for program managers (CBS for PMs) courses**
- **Collaboratively develop key process building blocks, eg spiral acquisition/development, requirements tradeoffs/ BPR, gap analysis, earned value, etc**
- **Evaluate applicability of component technology and “off the shelf commercial architectures” in DFAS systems/enterprise context**
- **Collaboratively develop/serve as Beta site for CBS in Practice course, targeting project engineers.**

# Possible Opportunities -2

- **Conduct product/technology evaluations and systems engineering/design experiments, including security issues such as Public Key Infrastructures (PKI), Digital Certificates, Cryptek security cards**
- **Create make/buy criteria and business case approaches**
- **Examine COTS sustainment issues in context of DFAS systems**
- **Case studies**

# Backup/More Detail

# Backup/More Detail

- **Expertise**
- **course details**
- **AFSAB stuff**

# DoD Views - 1

**“DoD must reduce acquisition costs through adoption of business processes characteristic of world class customers and systems.”**

William Perry, former Secretary of Defense, *Acquisition Reform: A Mandate for Change*, Feb 1994

**“My number one priority is to get systems that will be useful to combat forces and to do that as quickly, and with as low a cost as we possibly can, reducing the acquisition cycle time, and leveraging the latest available technology, in particular, information technology.”**

Paul Kaminski, former Under Secretary of Defense for Acquisition and Technology, testimony to the Senate Armed Services Committee, Mar 1997

# COTS-Based Systems Expertise -1

- **Design - patterns, engineering, architecture**
  - flexible integration**
  - heterogeneous systems**
  - proof of concept demonstration**
  - client/server**
- **Distributed object technology (DOT)**
  - Interoperation and integration - CORBA, DCOM, RMI**
- **Component technology**
  - Interoperation and integration - ActiveX, Java Beans**
- **Intranets/web-based systems**
  - interoperation among Netscape, Microsoft, Sun**
  - Legacy system and data integration**
  - public key infrastructure (PKI)**
- **Product and technology evaluation**
  - COTS evaluation strategies**
  - testbed operation**
  - creation of model problems**



# COTS-Based Systems Expertise

-2

- **Open systems**

- planning for, exploiting standards

- JTA, DII/COE

- interoperation

- **Acquisition**

- DoD policy and regulations

- acquisition planning guidance

- key paradigm shifts associated with COTS approach

- **Large, complex systems**

- air traffic control/FAA

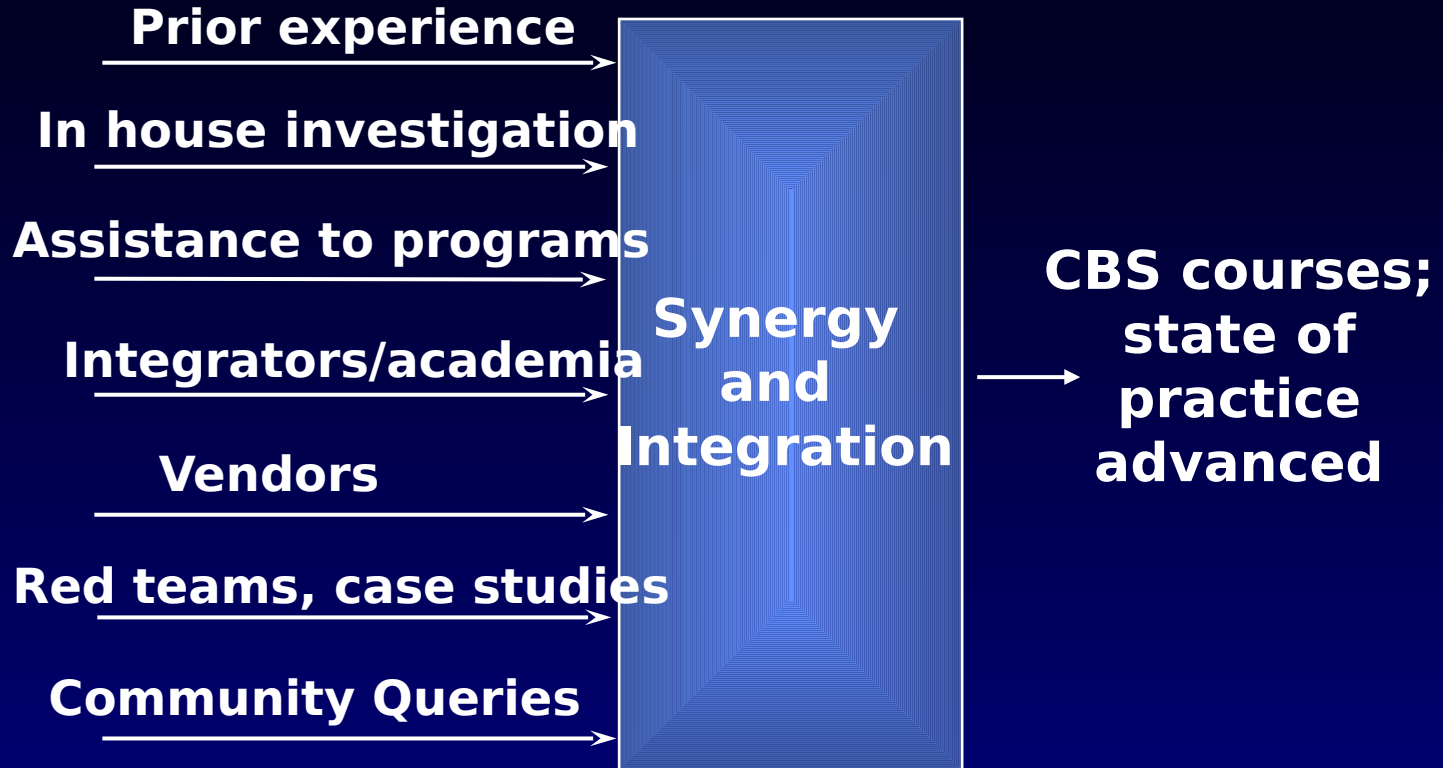
- command and control

- logistics and transportation

- Navy Systems

# Building COTS courseware

## Info sources



# Government Pricing

<u>Course</u>	<u>Tuition</u>	+	<u>Travel</u>
<b>CBS for Execs</b>	<b>\$7.5K</b>		<b>1 presenter</b>
<b>CBS for Program Managers</b>	<b>\$8.5K</b>		<b>1 presenter</b>
<b>CBS for PMs, w/ Extended Disc...</b> <b>presenters</b>	<b>\$10K</b>		<b>2</b>
<b>CBS for PMs workshop</b>	<b>\$18K</b>		<b>2 presenters</b>
<b>Open Systems for Executives</b>	<b>\$5K</b>		<b>1 presenter</b>
<b>Open Systems (2+ days)</b>	<b>Not currently priced</b>		
<b>COTS Evaluation</b>	<b>Not available</b>		
<b>CBS in Practice</b>	<b>Not available</b>		

# COTS-Based Systems (CBS) for Executives

- **Purpose:** address major challenges and opportunities in using COTS products from an Executive perspective
- **Goal:**
  - heightened Executive awareness
  - ideas for getting started
- **Contents:**
  - fundamental definitions and concepts
  - Keys for COTS-based System Success, with Executive actions and “look-fors”
  - recommendations
- **Duration/attendance:**
  - 2.5 hour briefing; maximum attendees: 25

# COTS-Based Systems for Program Managers

- **Purpose:** Address major challenges, issues, and opportunities when using COTS products
- **Goal:** heightened PM awareness
- **Contents:**
  - fundamental definitions and concepts
  - Keys for COTS-based System Success (abridged)
  - overview of major engineering, business, acquisition, and management activities impacted by COTS-based systems
  - recommendations
- **Duration/attendance:**
  - 4-5 hour briefing; maximum attendees: 25

# COTS-Based Systems for Program Managers w/ Extended Discussion

- **Purpose:** Same as CBS for program managers, with added discussion period
- **Contents (technical and management examples):**
  - inter-relationship of evaluation, design, and engineering in COTS context
  - identifying, early in development, key model problems requiring further analysis/experimentation, or...
- **Goal:**
  - focused discussion on topics of interest to a program, addressing application to their program situation.
- **Duration/Attendance:**
  - 4-5 hour briefing, plus up to 3 hours of discussion
  - Maximum attendees: 25

# Open Systems for Executives

- **Purpose:** Provide a high-level understanding and appreciation of an open systems approach for system acquisition.
- **Contents:**
  - practical definitions
  - basics of an open systems approach (product and process)
  - engineering issues, what to look for
  - real (especially weapon system) program experiences
- **Goal:**
  - heightened Executive awareness of open systems issues and requirements
  - ideas for getting started
  - be equipped to ask substantive questions
- **Duration/Attendance:**
  - 4-5 hour briefing, Maximum attendees: 20

# Key Elements of COTS Policy - Acquisition Strategy Review

- **All operational requirements and procurement specifications should be negotiable**
  - **Focus on the output rather than the input**
  - **Involve industry before ORD and RFP are finalized**
- **Open system architecture & spiral development essential**
- **Incentivize prime contractor to provide a credible estimate of support costs**
- **Use Total Ownership Cost as source selection cost criterion**
- **Assess the contractor's past experience employing COTS products**



# Key Elements of COTS Policy - Source Selection Evaluation

- **Evaluate contractor's COTS processes for assessing, selecting, integrating, supporting & refreshing**
- **Use Total Ownership Cost (TOC) to determine suitability of COTS versus custom products**
- **Assess contractor's understanding of the commercial marketplace and relevant COTS products**
- **Ensure system application matches the COTS product functionality**
- **Verify contractor proposes to use COTS products without modification**

# Key Elements of COTS Policy - Program Management

- **Conduct trade-off analyses of all changes vs Total Ownership Cost (TOC)**
- **Enforce ongoing interaction between government personnel (ops & acquisition) and prime contractor in Integrated Product Teams**
  - Facilitates trades between requirements & TOC**
  - Collocate is preferable**